

# 公告

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## 發明專利說明書

一、發明 名稱	中 文	附有血壓計功能之心電圖量測裝置
	英 文	
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## 四、中文創作摘要（創作之名稱：

## 附有血壓計功能之心電圖量測裝置

本創作係提供一種附有血壓計功能之心電圖量測裝置，係於輕巧可隨身攜帶之本體上增設有三電極觸摸鍵，手指按壓該電極觸摸鍵，電極所產生之電流可透過多個運算放大器進行訊號放大、比較及高低過濾波等作業，以取出心電圖訊號，該訊號直接送入微電腦中進行運算處理，再由顯示器之心電圖顯示區顯示出波形資料，並由顯示器之脈搏顯示區顯示出心率值；而輸入端與微電腦連接之壓力感應器亦可透過多個運算放大器進行訊號放大、比較及高低過濾波等作業，以取出血壓及脈搏兩種訊號，該訊號可送入微電腦中進行運算處理，再由顯示器顯示血壓及脈搏數值資料者。。

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## 英文創作摘要（創作之名稱：

## 五、創作說明 (1)

本創作係有關於一種附有血壓計功能之心電圖量測裝置，尤指一種心電圖量測時具 QRS interval 與 ST segment 計算與記錄功能及心率計算功能，能提供心率不整等簡單診斷訊息，並可經 RS232 傳輸線直接輸出顯示於電腦螢幕，記錄波形資料，具簡易電極及輕巧機體可隨身攜帶並可即時量測，具外接電極接線插頭裝置可連線測量靜態或動態心電圖，心電圖資料記憶容量可達 50 組，方便自己或提供給你的醫生參考者。

按，現今已知的心電圖測量裝置 (Electro-cardiograph)，大都是利用大型的量測儀器連接若干外接電極貼附於量測者之胸部心臟周邊，以讀取心電圖，然而該心電圖量測裝置，體積龐大、無法隨身攜帶且操作不易，一般未接受專業訓練之人士無法操作，而且若干條貼附之外接電極相當困擾著量測者；再者，一般習用之心電圖量測裝置只具有量測心電圖之功用並未有血壓計之功能，量測者如果欲量測收縮壓、舒張壓或脈搏之數值，必須要另外取用血壓計才可為之，因此非常的麻煩，沒有一機兩用之附加價值。

本創作人有鑑於此，累積從事此行多年之經驗，乃精心研究並再三測試改良，如今終於創作出一種新型的附有血壓計功能之心電圖量測裝置，可以摒除習用產品之缺點，以增進功效者。

緣是，本創作之主要目的在於提供一種附有血壓計功能之心電圖量測裝置，係可分別提供心電圖與血壓量測功能，其中心電圖量測時具 QRS interval 與 ST segment 計算與記錄功能及心率計算功能，故能提供心率不整等簡單診斷訊息；並可經 RS232 傳輸直接顯示於電腦螢幕，並記錄波形資料者。

本創作之另一目的在於提供一種附有血壓計功能之心電圖量測裝置，由於其具簡易電極，僅需利用雙手之姆指及食指觸摸本體之三電極觸摸鍵；並可外接電極接線插頭以連線測量靜態或動態心電圖者。

本創作之又一目的在於提供一種附有血壓計功能之心電圖量測

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## 五、創作說明(2)

裝置，本創作整個機體質輕且小巧，因此可隨身攜帶並可即時量測，不需大型的心電圖儀器及專業人士便可為之；亦可外接電極，以長時間量測臥病在床之病患者。

本創作之再一目的在於提供一種附有血壓計功能之心電圖量測裝置，係具血壓計功能，可自動充氣與自動漏氣測量血壓及心率資料並記錄者。

爲了讓 貴審查委員對本創作有更進一步的了解，茲佐以圖示詳細說明本創作如下：

### (一)圖式部份：

第一圖：係本創作之外觀圖。

第二圖：係本創作實施例之外觀圖。

第三圖：係本創作之主電路圖。

第四圖：係本創作血壓感應之電路圖。

第五圖：係本創作心電圖感應之電路圖。

第六圖：係本創作顯示器配置之示意圖。

第七圖：係本創作之底視圖。

### (二)圖號部份：

(1)本體	(11)顯示器	(111)收縮壓顯示器
(112)舒張壓顯示區	(113)日期顯示區	(114)時間顯示區
(115)脈搏顯示區	(116)記憶組數顯示區	(117)圖像顯示區
(1171~1174)圖像	(118)心電圖顯示區	(119)心率不整訊息顯示區
(12)電極觸摸鍵	(13)血壓記憶呼叫鍵	(14)心電圖記憶呼叫鍵
(15)時間設定鍵	(16)心電圖啓動鍵	(17)血壓啓動鍵
(2)手腕氣囊套	(21)管線	(3)微電腦
(31)輸出入接頭	(32)穩壓電路	(33)壓力感應器
(34~38)運算放大器	(41~48)運算放大器	(X)脈搏
(Y)血壓	(Z)心電圖訊號	

請參閱第一圖所示，本創作本體 1 上表面形成有可顯示多樣化

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## 五、創作說明 (3)

資訊的液晶顯示器 11，顯示器 11 左、右兩側下方及底部（如第七圖）共具有三圓形之電極觸摸鍵 12，顯示器 11 下方中間由左至右依序設置有血壓記憶呼叫鍵（BP M/R）13、心電圖記憶呼叫鍵（ECG M/R）14、時間設定鍵（T）15、心電圖啟動鍵（ECG O/I）16 及血壓啟動鍵（BP O/I）17 等數個功能按鍵；參閱第二圖所示，本體 1 背側亦可插接一管線 21 以連接手腕氣囊套 2，用以捲繞手腕上調測血壓者。而本體 1 亦可外接電極接線插頭，以便若干電極貼附於量測者之心臟位置，量測靜態或動態心電圖者。

關於本創作內部結構方面，概為如第三～五圖所示，其中第三圖為顯示主控制電路，第四圖為顯示血壓壓力感應電路，第五圖為顯示心電圖壓力感應電路；其中在第三圖中為以一微電腦 3 為核心，微電腦 3 係以其輸出入接腳連接位在圖面左上方位之顯示器 11 及位在圖面中間右方位之各功能鍵 13~17 等，亦與一記憶體輸出入接頭 31 連接，以供資料輸出入，圖面右上方為穩壓電路 32，圖面右下方則為驅動充氣囊充氣以及洩壓之控制迴路；而第四圖之壓力感應電路即以一壓力感應器 33 為主體，透過多個運算放大器 34~38 進行訊號放大、比較以及高低過濾波等作業，而取出血壓 Y 以及脈搏 X 兩種訊號，該血壓 Y 及脈搏 X 訊號由第三圖中間左下方之接點直接送入至微電腦 3 中，如此，即可透過微電腦 3 進行運算處理，再由顯示器 11 顯示血壓及脈搏數值資料者。參閱第五圖所示，為顯示心電圖壓力感應電路，即心電圖量測者僅以雙手大姆指及一食指按壓本體 1 之三電極觸摸鍵 12（如圖一及圖七），其電極所產生之電流透過多個運算放大器 41~48 進行訊號放大、比較以及高低過濾波等作業，而取出心電圖訊號 Z，該心電圖訊號 Z 由第三圖中間左下方之接點直接送入至微電腦 3 中，如此，即可透過微電腦 3 進行運算處理，再由顯示器 11 顯示心電圖資料者。

關於本創作該顯示器 11 的顯示型態上，為如第六圖所示，係區分為左右及上中下等多個顯示區，右上方及右中位置分別設置三位

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## 五、創作說明(4)

數字之收縮壓顯示區 111 以及舒張壓顯示區 112，圖面左上方及左中及左下位置分別為日期顯示區 113、時間顯示區 114 以及脈搏顯示區 115，圖面中間下方位置則設置記憶組數顯示區 116，供表示內部記憶的資料總數以及現在顯示的記憶組數。

在顯示器 11 的右下方位置為以四組形成不同擬人圖形之圖像 1171~1174 所組成之圖像顯示區 117，此圖像顯示區 117 為選擇性地點亮，以供指示出此次血壓量測之血壓狀況，在圖像顯示區 117 之由右至左係分別為代表高血壓圖像 1174、血壓偏高圖像 1173、正常血壓圖像 1172 以及低血壓圖像 1171，此等圖像為透過迴路亦為直接連接至第三圖之微電腦 3 上，當測得一組收縮壓及舒張壓時，即與微電腦 3 內部之血壓參考資料進行比較（此等參考資料為依照世界衛生組織所訂定之標準建立），而觸發其一圖像點亮，達到直接顯示出吾人血壓的綜合狀況者。

再者，在顯示區 11 中間位置為心電圖顯示區 118，該心電圖量測時具 QRS interval 與 ST segment 計算與記錄功能及心率計算功能，能提供心率不整等簡單診斷訊息，並可經 RS232 傳輸線直接輸出顯示於電腦螢幕，記錄波形資料，具簡易電極及輕巧機體可隨身攜帶並可即時量測，具外接電極接線插頭裝置可連線測量靜態或動態心電圖，心電圖資料記憶容量可達 50 組，方便自己或提供給你的醫生參考者。當按壓時間設定鍵 15，亦可由日期顯示區 113 或時間顯示區 114 顯示日時之時鐘功能；亦可由心電圖顯示區 118 顯示出波形資料，並可由脈搏顯示區 115 顯示出心率值；另，脈搏顯示區 115 下方為心率不整訊息顯示區 119，可提供心率不整等簡單診斷訊息者。

經由上述說明，可知本創作具以下功能：

- 1、可量測心電圖。
- 2、具 QRS interval 與 ST segment 計算與記錄功能及心率計算功能，能提供簡單診斷訊息如心率不整。

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## 五、創作說明(5)

- 3、可經 RS232 傳輸直接顯示於電腦螢幕，並記錄波形資料。
- 4、具簡易電極及輕巧機體可隨身攜帶並可即時量測。
- 5、具電極接線插頭可連線測量靜態或動態心電圖。
- 6、具血壓計功能可自動充氣與自動漏氣測量血壓及心率資料並記錄。
- 7、低電壓偵測。
- 8、具操作錯誤偵測及狀態顯示。
- 9、具時鐘功能。

綜上所述，本創作附有血壓計功能之心電圖量測裝置，可以分別提供心電圖與血壓量測功能，依照測得之心率及血壓數據資料，再經微電腦處理而顯示於電腦螢幕，其簡易之電極觸摸鍵及輕巧機體可隨身攜帶並可即時量測，為一具創作之新型產品，其實用功效當無庸置疑，而本創作又從未公諸於市或已見於其他書刊文獻，實以符合專利法之規定，爰依法提出申請之。

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## 六、申請專利範圍

- 1、一種附有血壓計功能之心電圖量測裝置，係包括本體表面可顯示多樣化資訊之顯示器、與本體內部微電腦連接之若干功能按鍵及藉管線與本體連接之手腕氣囊套，其特徵在於：

本體上設有三電極觸摸鍵可供量測者大姆指及食指按壓，其電極所產生之電流可透過多個運算放大器進行訊號放大、比較及高低過濾波等作業，以取出心電圖訊號，該訊號直接送入微電腦中進行運算處理，再由顯示器之心電圖顯示區顯示出波形資料，並由顯示器之脈膊顯示區顯示出心率值；而輸入端與微電腦連接之壓力感應器亦可透過多個運算放大器進行訊號放大、比較及高低過濾波等作業，以取出血壓及脈膊兩種訊號，該訊號可送入微電腦中進行運算處理，再由顯示器顯示血壓及脈膊數值資料者。

- 2、如申請專利範圍第1項所述之附有血壓計功能之心電圖量測裝置，其中顯示區上設有心率不整訊息顯示區，可提供心率不整等簡單診斷訊息者。
- 3、如申請專利範圍第1項所述之附有血壓計功能之心電圖量測裝置，其中心電圖量測時具 QRS interval 與 ST segment 計算與記錄功能，並經 RS232 傳輸線直接輸出顯示於電腦螢幕者。
- 4、如申請專利範圍第1項所述之附有血壓計功能之心電圖量測裝置，其中顯示器上亦可設置由多個圖像所組成之圖像顯示區，以代表血壓量測之綜合狀況者。

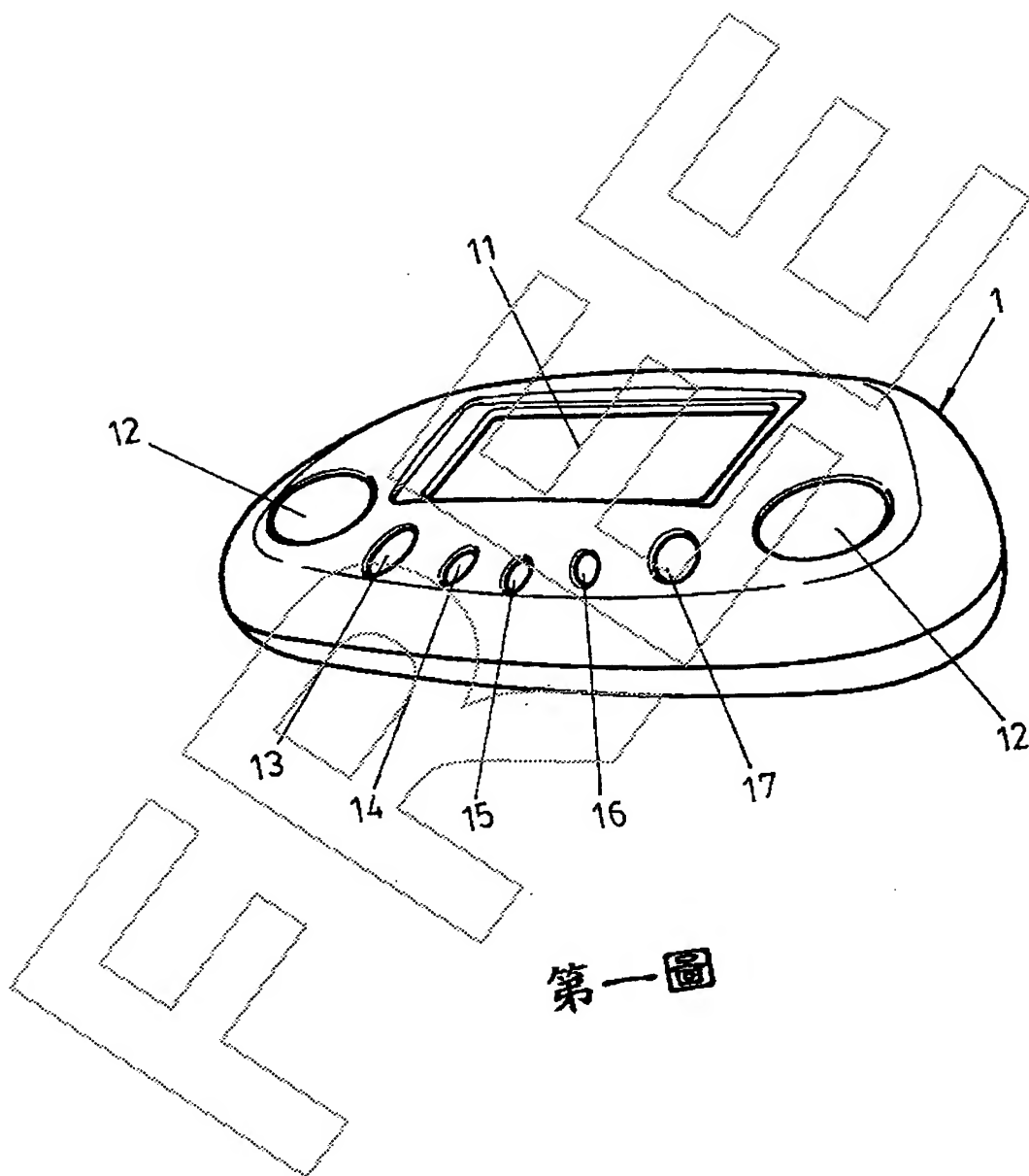
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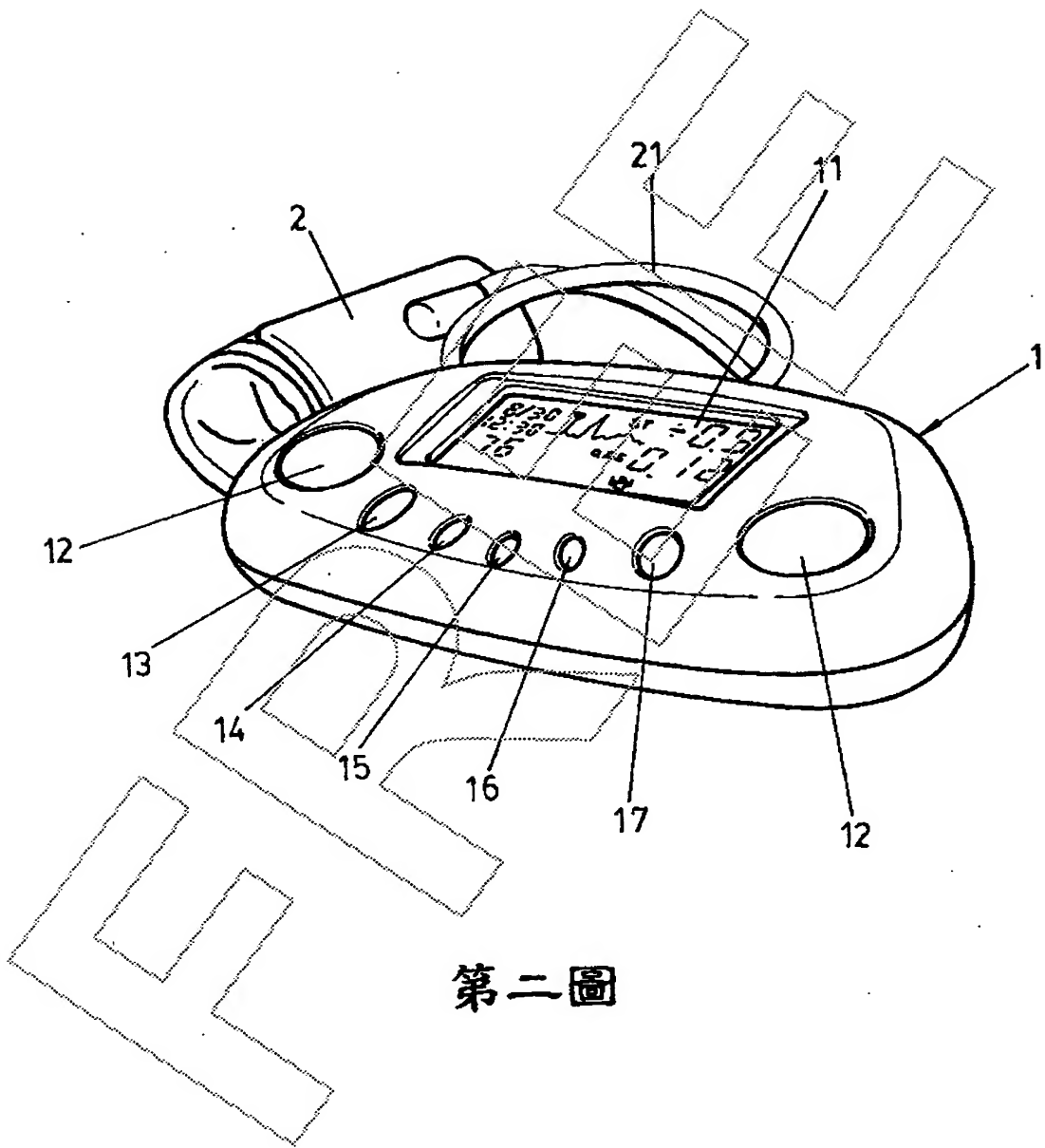
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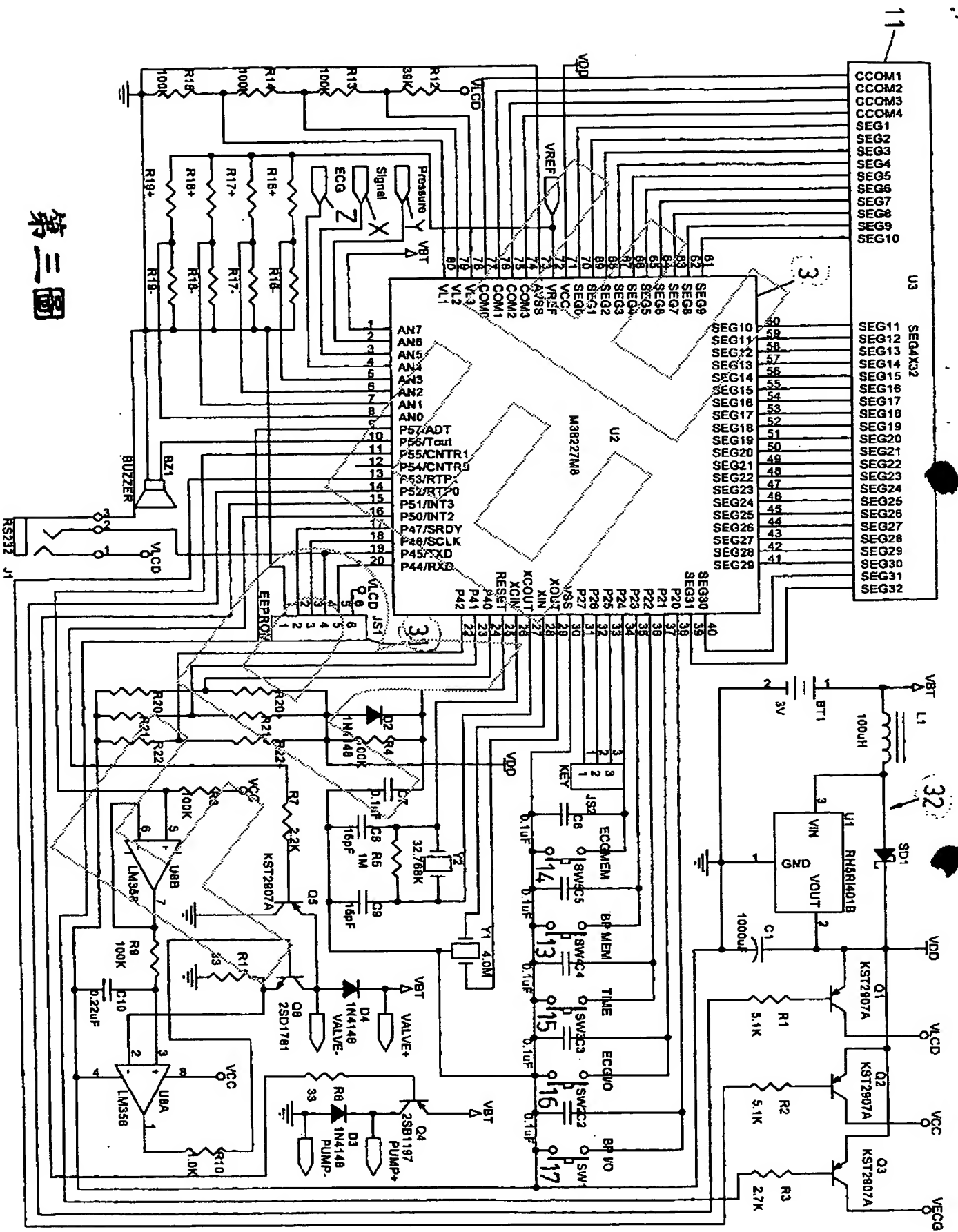




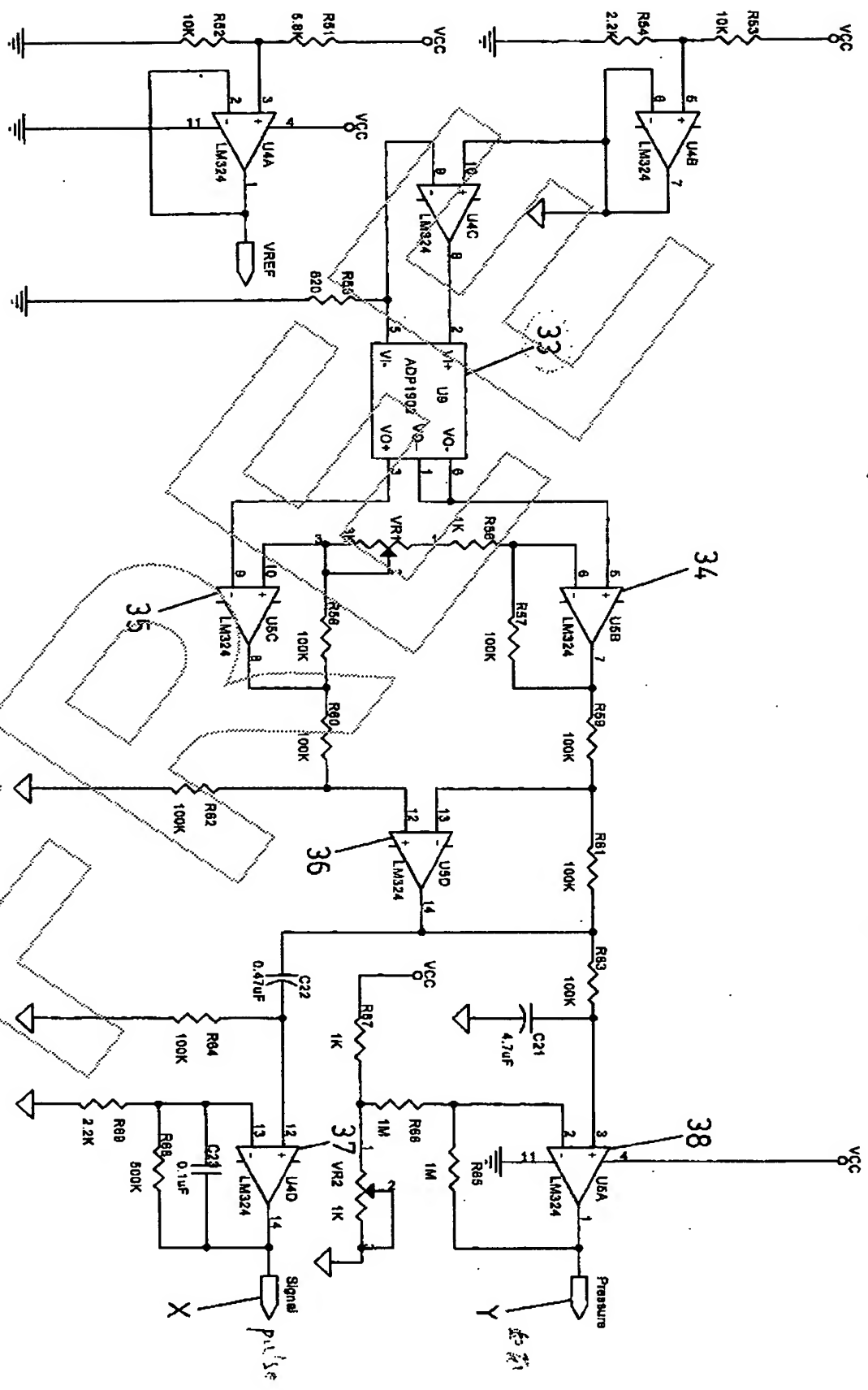
第一圖



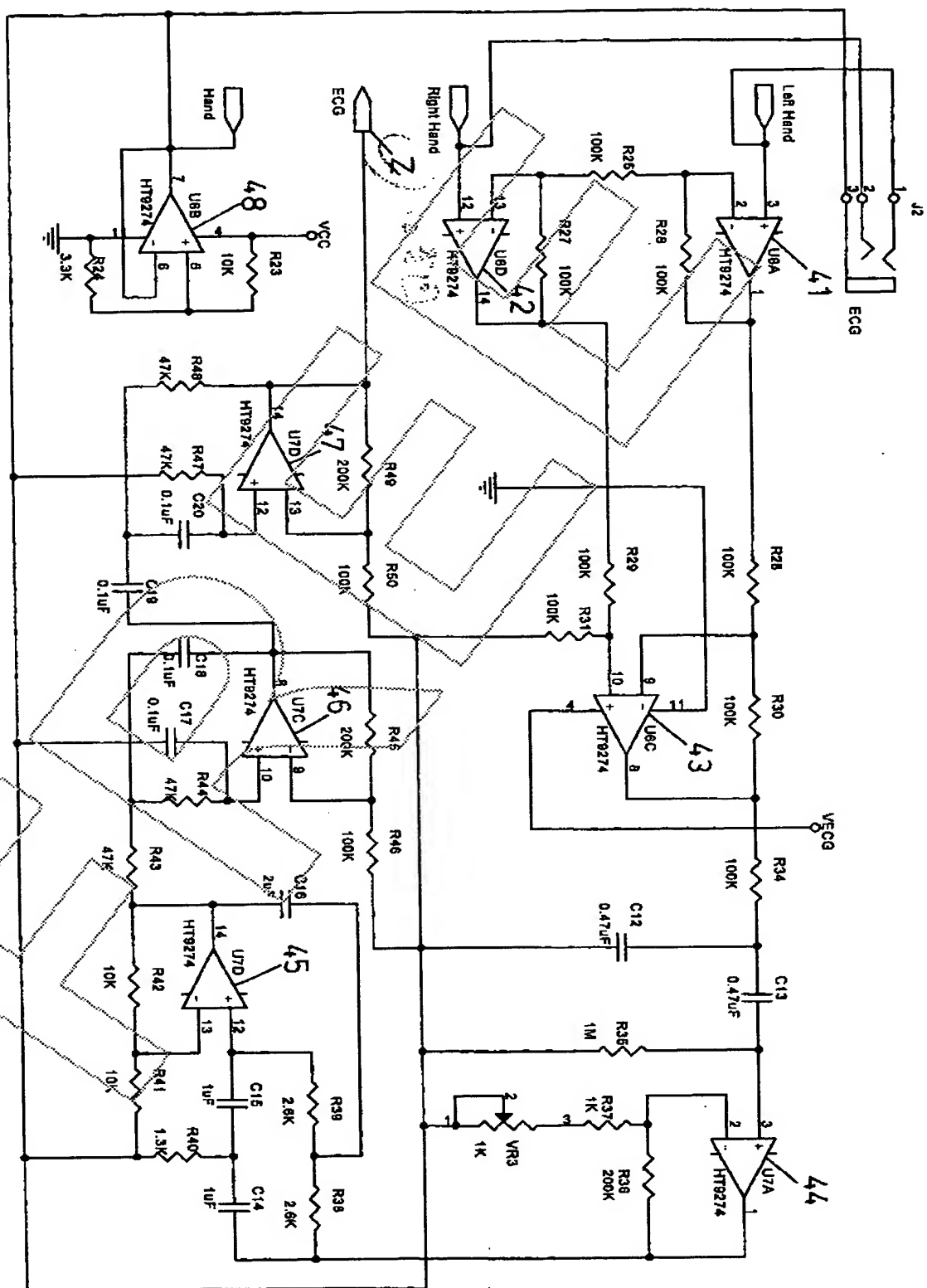
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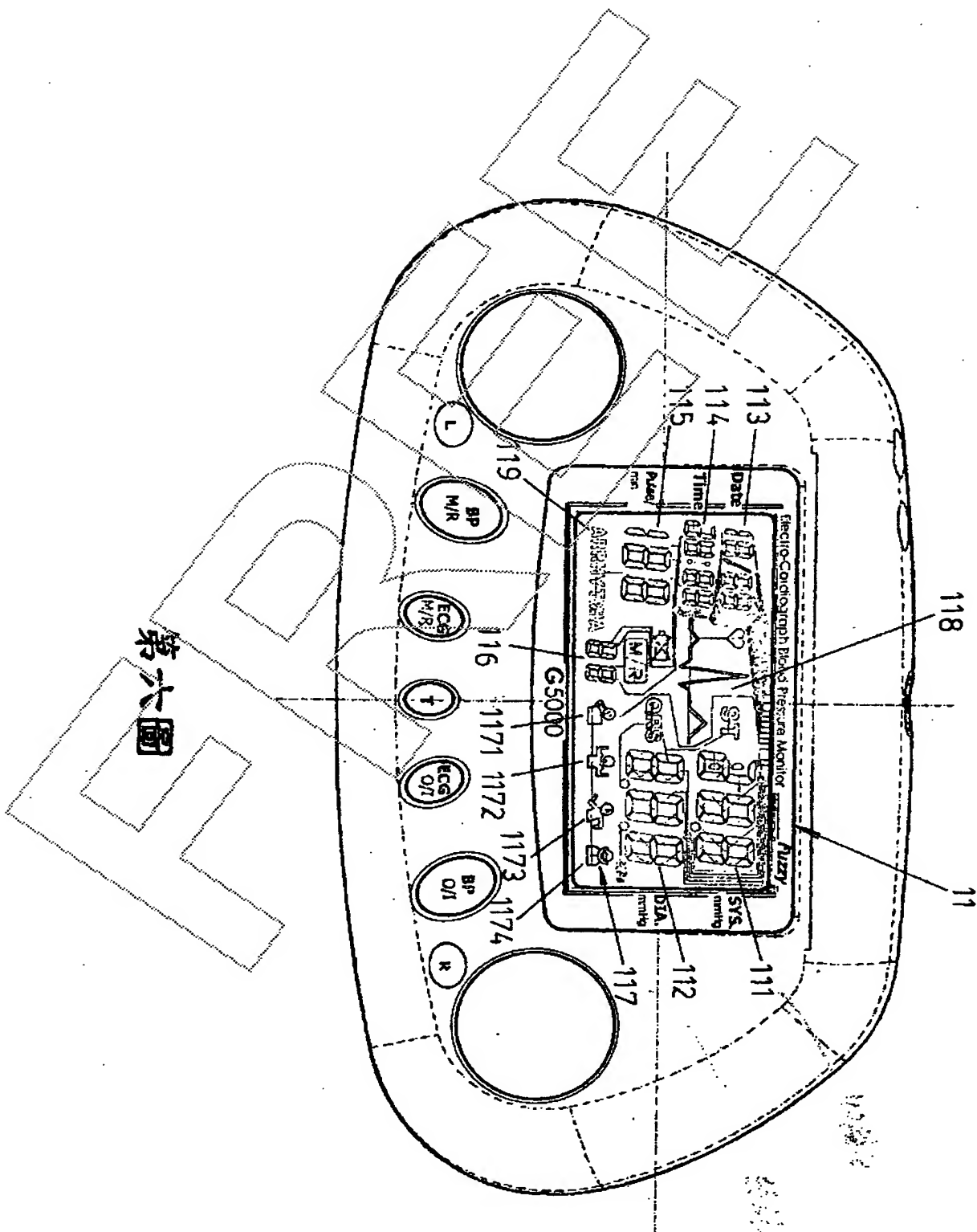
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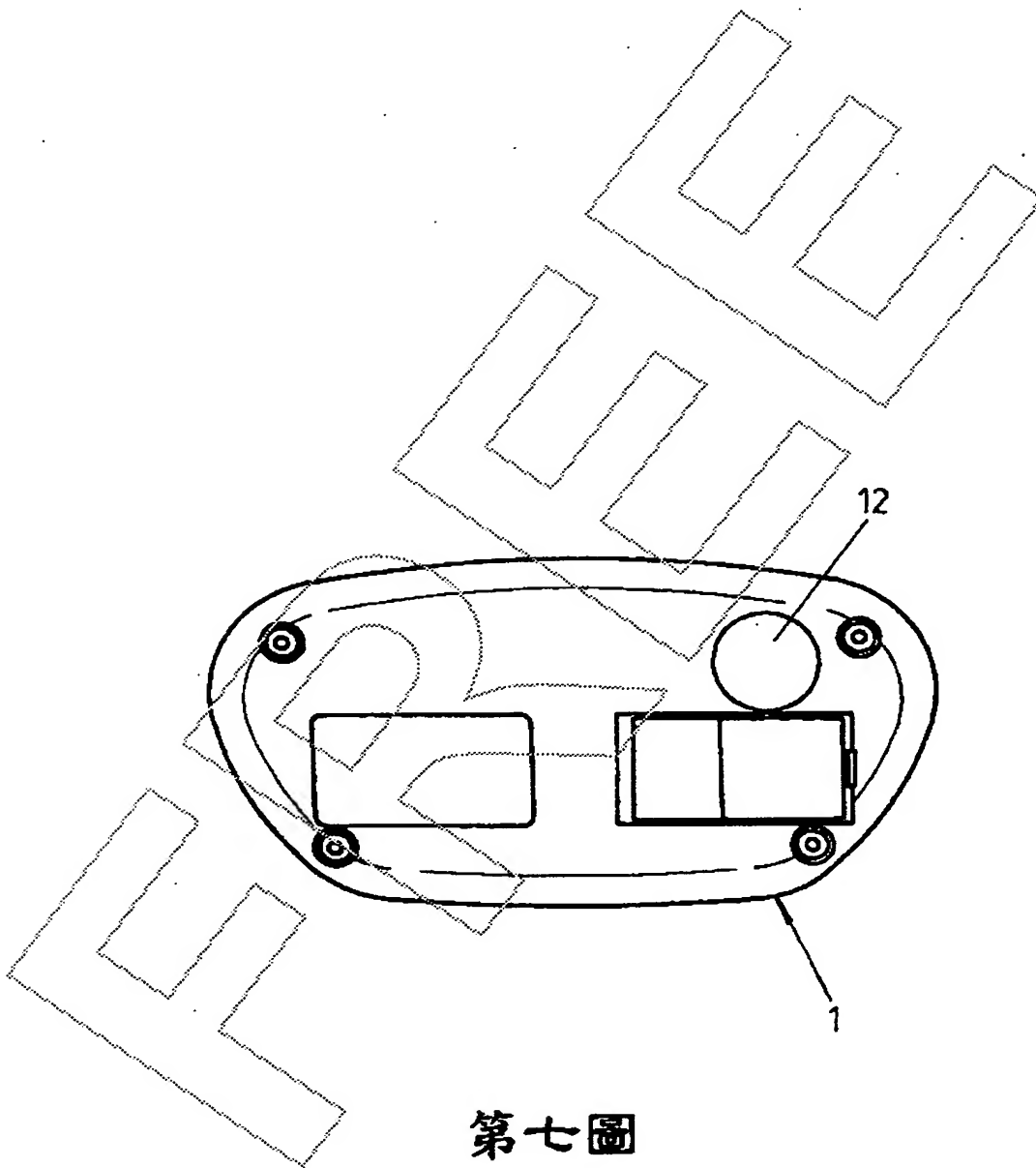
第四圖



第五圖



第六圖



第七圖

# **Electrocardiograph with sphygmomanometer function**

## **BACKGROUND OF THE INVENTION**

### **1. Field of the Invention**

The present invention provides an electrocardiograph with sphygmomanometer function. The electrocardiograph, measures and records QRS interval and ST segment parameters, calculates and diagnose heart efficiency and provides simple arrhythmic related diagnostic messages. The ECG signals are transmitted through RS232 cable and displayed directly on computer monitor. The invention has a handy and portable body with convenient electrode ready for measurement anytime. The invention has an external electrode cable connection for the measurement of resting and stress ECG. The invention can store up to 50 sets of ECG signals which can be used as reference for oneself or the physician.

### **2. Description of Related Art**

The currently known electrocardiograph utilizes large measurement devices with external electrode cable and pads. The electrode pads are pasted around the chest close to the heart to obtain ECG signals. These electrocardiographs are large in size, not portable, and not easy to operate. Professionals are needed to operate the device and connecting the external electrode may cause discomfort to some people taking measurements. In addition, a normal electrocardiograph only has ECG function and does not have sphygmomanometer function. A tester who wants to measure systolic and diastolic or pulse parameters, has to purchase a stand-alone blood pressure/sphygmomanometer unit. This is inconvenient and does not have the value added of a two in one device.



The inventor, based on several years of experience, focuses in researching and developing a new type of invention which is an electrocardiograph with sphygmomanometer functions. The invention not only overcome the inadequacy of a normal electrocardiograph but also increases its effectiveness.

## **SUMMARY OF THE INVENTION**

It is an objective of the present invention to provide sphygmomanometer function to an electrocardiograph. The invention can also provide ECG and BP measurements separately. The electrocardiograph, measures and records QRS interval and ST segment, calculates heart efficiency and provides simple arrhythmic related diagnostic messages; the parameters are transmitted through RS232 and displayed on the computer screen, and recorded the ECG signals of the individual.

It is another objective of the present invention to provide sphygmomanometer function to an electrocardiograph that has easy to use electrode. It only requires the thumbs from both hand, and an index finger to touch three electrode-touchable keys; the invention can connect external electrode cable connection to measure resting or stress ECG.

It is yet another objective of the present invention to provide sphygmomanometer function to an electrocardiograph. The design of the invention has a handy, light and portable body which allows measurement anytime. The taking of ECG signal with the invention does not require the usage of normal large electrocardiograph and the assistance of professionals; in addition the invention can connect external electrode cable for long term measurement of patient in bed.

It is yet another objective of the present invention to provide sphygmomanometer function to an electrocardiograph, which has an automatic air pump that inflate and deflate to measure and record blood pressure and heart pulse.

## BRIEF DESCRIPTION OF THE DRAWINGS

In order to let the committee member to understand the invention in more detail, the figures with detailed descriptions are provided below:

Fig. 1 is a 3-D sketch of a front view of an embodiment of the present invent;

Fig. 2 is another 3-D sketch of a front view of an embodiment of the present invent;

Fig. 3 is a main circuit diagram of the present invent;

Fig. 4 is a circuit diagram of the sphygmomanometer of the present invent;

Fig. 5 is a circuit diagram of the electrocardiograph of the present invent;

Fig. 6 is a display diagram of the present invent; and

Fig. 6 is a bottom view of the present invent.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Please refer to Figure 1, the body of the invention may present the parameters by several types of display 11. On the bottom left and right side, and the back side of the body (Please refer to Figure 7), there are three round shaped electrode-touchable keys 12. Below the display 11, from left to right, the first button is blood pressure memory/recall (BP M/R) key 13. The second button is ECG memory/recall (ECG M/R) key 14. The third button is time set key (T) 15. The fourth button is ECG start key (ECG O/I) 16. The last button is blood pressure start key (BP O/I) 17. Please refer to Figure 2, the back side of the invention's body 1 can be connected with a tube 21 to connect with a wrist air cuff 2, which can be wrapped around the wrist to measure blood pressure. The body 1 can also connect to an external electrode cable, which can be connected with electrode pad near the tester's heart, for testing of resting or stress ECG.

Regarding the invention's internal structure, it can be referred from Figure 3 to 5.

Figure 3 shows the control circuit diagram, Figure 4 shows the blood pressure sensory circuit diagram and Figure 5 shows ECG pressure sensory circuit diagram; In Figure 3, the nucleus is a microprocessor 3. The pin for microprocessor 3 is connect to the display 11 which shown on the top left corner of the figure 3. The pin for microprocessor 3 also connect to the button function 13~17 which shown on the mid-section of the right side of the figure 3. Further, the microprocessor 3 connected with a memory by pin 31 for the transferring of data. The top right hand corner shows the regulatory circuit 32, the bottom right hand corner is the driving circuit for inflation and deflation for the wrist air cuff. In Figure 4, the pressure sensory circuit uses the pressure sensor 33 as the core. It uses multiple operational amplifiers 34~38 to amplify the signals, compared and filtered for high/low frequencies, to obtain blood pressure Y and pulse X signals. The blood pressure Y and pulse X signals are transmitted to the microprocessor 3 for processing and the parameters computed are displayed on the display 11. Figure 5 shows the electrocardiograph pressure sensor circuit, the ECG measurer only needs to use the thumbs from both hand and a index finger to press on the electrode-touchable keys 12 of the body 1 (As shown in Figure 1 and 7). Current generated by the electrodes, by means of multiple operational amplifiers 41~48, is amplified, compared and filtered for high/low frequencies, to obtain ECG signals Z. The ECG signals Z will be transmitted to the microprocessor 3 through the connection point shown in the mid section of the bottom left mid section of Figure 3. As a result from the processing by microprocessor 3, the ECG results will be displayed on the display 11.

Regarding the display 11 format of the invention, as shown in Figure 6, the display is divided into left, right and top, middle and bottom part. The top right hand corner and the middle right side are allocated to display three numbers including systolic pressure display 111 and diastolic pressure display 112. The top left hand

corner and the middle left side is for date display 113, time display 114 and pulse display 115. The mid bottom section is for memory sets display 116 to provide the number of data stored internally and to display the number data set current displayed.

The bottom right corner of display 11 is composed of four different human body image icon 1171~1174 in figure display 117. The figure display 117 will light up accordingly to indicate the blood pressure condition. In the figure display 117 zone, from right to left respectively show decreasing blood pressure, the first image represents high blood pressure 1174, the second image represents slightly high blood pressure 1173, the third image represents normal blood pressure 1172, and the last image represents low blood pressure. These images are generated from the microprocessor 3 shown in Figure 3. When a set of systolic and diastolic pressure data is measured, the data will be compared with the reference data stored in the microprocessor 3 (The reference data is obtained from the World Health Organization's standard), and one of the image will be light up to indicated the blood pressure condition of the measurer.

In addition, in the mid section of the display 11 is the electrocardiograph display 118. The electrocardiograph measures, calculates and records QRS interval and ST segment, and calculates heart efficiency and provides simple arrhythmic related diagnostic messages. The ECG signals will be also recorded and the parameters can be transmitted through RS232 and displayed on the computer screen. The handy and portable device allows measurement anytime, and it is equipped with an external electrode connection to measure resting or stress ECG. The invention can store up to 50 sets of data and be provided as reference for your physician. When the time set key 15 is pressed, the date and time can be set by looking at the date display 113 and time display 114. Electrocardiograph display 18 will show ECG signals. The pulse display 115 area will show heart rate. Next, at the bottom of the pulse display 115 is

arrhythmia warning message display 119 zone, which will provide simple diagnosis of arrhythmia.

Based on the description above, this invention has the features below:

1. Measurement of ECG
2. Measures and calculates and records QRS interval and ST segment, and provides simple arrhythmic related diagnostic messages
3. Data can be transferred and displayed on the computer screen through RS232, and records ECG signals
4. Handy and portable body with three electrode-touchable keys ready for measurement anytime
5. External electrode cable to measure resting or stress ECG
6. Has sphygmomanometer function with automatic air pump to inflate and deflate for measurement of blood pressure and heart efficiency; with recording function
7. Low voltage detection
8. Operation error display and condition display
9. Time/date function

Based on the description above, the present invention provides an electrocardiograph with sphygmomanometer function. The invention can provide ECG and sphygmomanometer function separately. The heart rate and blood pressure data is obtained and analyzed by the microprocessor and display on computer screen. It has a handy and portable body and three electrode-touchable keys which allows measurement anytime. This is a new invention, and its functions have been validated. This invention has not been published in any other publication, and confirms with the regulations of patent law. The invention is applied accordingly.

## WHAT IS CLAIMED IS:

1. An electrocardiograph with sphygmomanometer function, including a display panel set on a body to display multiple parameters, and a microprocessor to operate the function buttons and connector tube to the wrist air cuff, with features as described below:

The body has three electrode-touchable keys for the tester to use the thumbs and index finger to press on. The current from the electrode is amplified, compared and filtered for high/low frequencies, to obtain ECG signals. The ECG signals are then transmitted to a microprocessor to be processed and computed. The relevant waveform and heart rate are shown on an ECG display section and a pulse display section of a display unit. The current displayed generated by a pressure sensor which is, at an input end thereof, connected to the microprocessor is also being amplified, compared to produce blood pressure and pulse signals. These signals are then transmitted to the microprocessor to be processed and computed, and finally the values of the blood pressure and pulse rate are also shown on the display unit.

2. The electrocardiograph with sphygmomanometer function of claim 1, wherein the display panel includes a display section to prove simple arrhythmia diagnostic messages.
3. The electrocardiograph with sphygmomanometer function of claim 1, wherein the electrocardiograph measures, calculates and records QRS interval and ST segment and transmits data through RS232 to display on the computer screen
4. The electrocardiograph with sphygmomanometer function of claim 1, wherein the display is composed of several images to represent the comprehensive blood pressure condition.

**ABSTRACT:**

An electrocardiograph with sphygmomanometer function, comprising a handy and portable body and three electrode-touchable keys mounted on the body. When fingers of a subject are set on the electrode-touchable keys, current generated by the electrodes is being, by means of multiple operational amplifiers, amplified, compared, and filtered for high/low frequencies, to obtain ECG signals. The ECG signals are then transmitted to a microprocessor to be processed and computed, and finally the relevant waveform and heart rate are separately shown on an ECG display section and a pulse display section of a display unit. Besides, current generated by a pressure sensor which is, at an input end thereof, connected to the microprocessor is also being amplified, compared, and filtered for high/low frequencies by the multiple operational amplifiers to produce blood pressure and pulse signals. These signals are then transmitted to the microprocessor to be processed and computed, and finally the values of the blood pressure and pulse rate are also shown on the display unit.

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